



NJ Department of Environmental Protection
Water Monitoring and Standards
Marine Water Monitoring

**Sanitary Survey of Shellfish Growing Area NE5
Manasquan River**



December 2016

Sanitary Survey of Shellfish Growing Area NE5 Manasquan River

New Jersey Department of Environmental Protection (NJDEP)

Bureau of Marine Water Monitoring (BMWM)

Robert Schuster, Chief

December 2016

Data from August 1, 2013 – August 31, 2016

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Acknowledgements:

This report was written under the direction of NJDEP WM&S administration. Special acknowledgment is given to the Boat Captains, the laboratory staff, and the technical and support staff.

Cover Photo by Tracy Fay

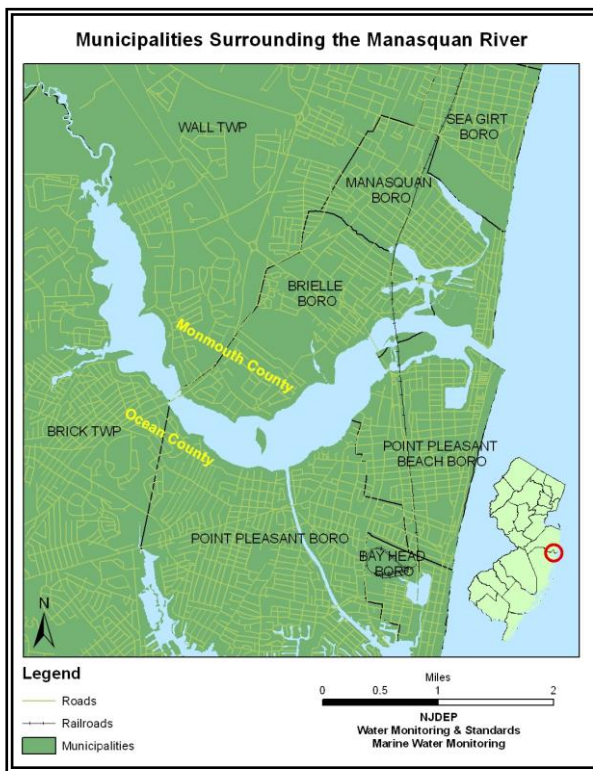
TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
DESCRIPTION OF GROWING AREA	1
Location & Description.....	1
Growing Area Classification Summary	2
Evaluation of Biological Resources.....	3
SHORELINE SURVEY: EVALUATION OF POTENTIAL POLLUTION SOURCES.....	3
Land Use	4
Surface and Ground Water Discharges.....	5
Marinas	5
Spills, Unpermitted Discharges, and Closures.....	6
Stormwater Discharges	7
WATER QUALITY STUDIES.....	8
Sampling Strategy	8
Bacteriological Quality	8
Compliance with NSSP Criteria	8
Rainfall Effects	10
Seasonal Effects	11
RELATED STUDIES	12
Nutrients.....	12
Phytoplankton	12
Bathing Beaches.....	12
Toxic Monitoring.....	12
CONCLUSIONS	13
RECOMMENDATIONS.....	14
LITERATURE CITED	14
APPENDICES	15

EXECUTIVE SUMMARY

Shellfish Growing Area NE5, the Manasquan River, divides Ocean County and Monmouth County and connects to the Atlantic Ocean via the Manasquan Inlet (see below figure). It also connects to the Barnegat Bay through the Point Pleasant canal. Currently, the Manasquan River is classified as *Prohibited* upstream of the Route 70 Bridge and *Restricted* downstream of the Route 70 Bridge. The Point Pleasant canal, Lake Louise and the Glimmer Glass region are classified as *Prohibited* (see figure on page 2). The

approximate size of this shellfish growing area is about 1,320 acres. There are no direct discharges into the Manasquan River, although there are numerous stormwater outfalls and other indirect discharges. The previous reappraisal report recommended that the waters of Lake Louise and the Glimmer Glass region be downgraded from *Restricted* to *Prohibited*; these changes were adopted into regulation (N.J.A.C. 7:12) in 2016.



Water samples from the Manasquan River were collected (using the Systematic Random Sampling strategy) and analyzed from 34 sampling stations for fecal coliform levels during the period of August 1, 2013 to August 31, 2016 for this Sanitary Survey report. Two stations, 1303 & 1309B, are not in compliance with the National Shellfish Sanitation Program's Guide for the Control of Molluscan Shellfish (NSSP Guide, 2015) criteria because they exceed the Estimated 90th Percentile criteria for fecal coliform. However, these stations, as well as many other stations, saw a spike in fecal coliform levels on June 29, 2015 when it rained over 2 inches within 48 hours of sampling. This situation is further explained in the

“Compliance with NSSP Criteria” portion of this report. Therefore, no downgrade is being recommended at this time. All remaining sampling stations comply with their criteria for *Restricted* and *Prohibited* classifications, respectively. Some changes to shorelines and hydrography occurred in this area during this timeframe.

This report recommends that the Bureau of Marine Water Monitoring (BMWM) continue to monitor the Manasquan River fecal coliform levels, perform targeted sampling during storm events to identify potential sources of pollution, and work with the local municipalities to address areas identified during targeted sampling and to take actions or corrective measures to improve the bacterial water quality.

DESCRIPTION OF GROWING AREA

Location & Description

The Manasquan River is approximately 26.5 miles long and serves as a boundary, separating Ocean County from Monmouth County (see above figure). This river connects to the Atlantic Ocean via the

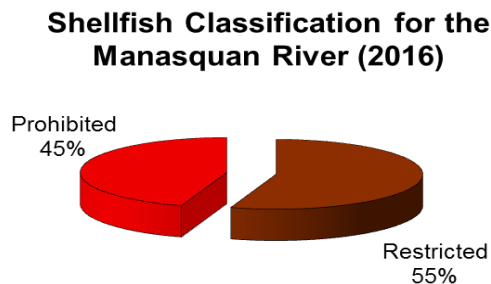
Manasquan Inlet. It also connects to the Barnegat Bay through the Point Pleasant Canal. The Manasquan River is the northernmost entry point to the Intracoastal Waterway.

The major tributaries of the Manasquan River are Squankum Brook, Debois Creek, Mingamahone Creek, and Marsh Bay Brook.

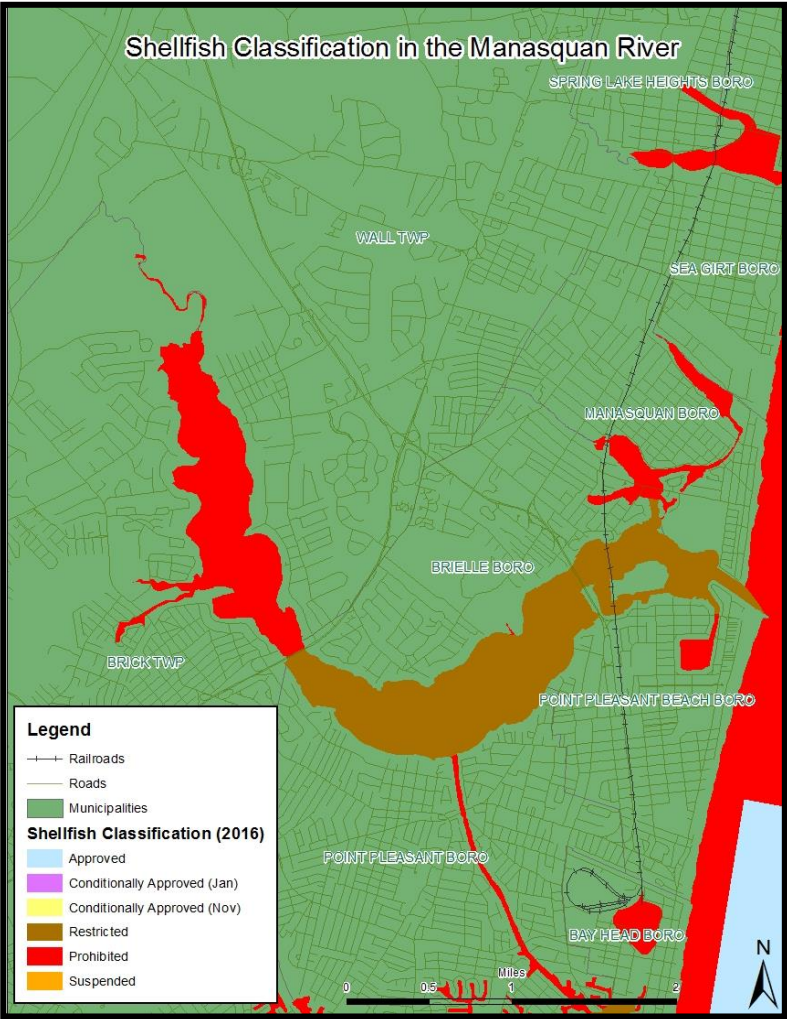
There are six municipalities surrounding the Manasquan River, three in Monmouth County and three in Ocean County. Brielle Borough, Manasquan Borough, and Wall Township are located in Monmouth County; Point Pleasant Beach Borough, Point Pleasant Borough, and Brick Township are located in Ocean County (see figure on page 1).

Growing Area Classification Summary

This report concentrates on the approximately 1,320 acres of shellfish growing waters within the Manasquan River Estuary. There are currently about 720 acres of *Restricted* waters and 600 acres of *Prohibited* waters in the Manasquan River.



In 1961, the entire Manasquan River, NE5, was classified as *Prohibited* for harvesting shellfish. In 1987 the classification of the entire river was upgraded to *Restricted*. In 1990, 424 acres northwest of the Route 70 bridge were downgraded from *Restricted* to *Prohibited* due to high coliform levels associated with nonpoint source runoff. In 2016, the waters of Lake Louise and the Glimmer Glass region were downgraded from *Restricted* to *Prohibited* due to high fecal coliform levels associated with nonpoint source runoff. Currently, the area upstream of the Route 70 bridge is classified as *Prohibited*, as is the Point Pleasant canal, Lake Louise, and the Glimmer Glass region. The remaining portion of the river, downstream of the Route 70 Bridge, is classified as *Restricted* (see adjacent figure).



There is no harvesting allowed in the *Prohibited* region of the Manasquan River. It is illegal to harvest shellfish from *Restricted* waters for direct market due to the higher levels of bacteria found in these water. Shellfish harvested from *Restricted* waters must undergo a process called depuration before they are marketable. Depuration is a process that purifies the shellfish by pumping UV treated bacteria-free water through clams in holding tanks for a minimum of 48 hours, thus rendering a product that will be safe for consumption. The BMWW along with Fish & Wildlife determine the areas that are approved for depuration and the BMWW must issue a depuration permit to allow harvest from these specific areas. Currently the Manasquan River is not designated as an area for depuration. Recreational harvest of shellfish is not permitted from *Restricted* waters. The Manasquan River is displayed on the current State of New Jersey Shellfish Growing Water Classification Chart (NJDEP) or on the Bureau of Marine Water Monitoring's (BMWW) website at <http://www.state.nj.us/dep/bmw/>; the official classification descriptions can be found at *N.J.A.C. 7:12*, Shellfish Growing Water Classifications.

Evaluation of Biological Resources

Commercially important shellfish native to New Jersey include hard clams (*Mercenaria mercenaria*), soft-shell clams (*Mya arenaria*), blue mussels (*Mytilus edulis*), eastern oysters (*Crassostrea virginica*), ocean quahogs (*Arctica islandica*), surf clams (*Spisula solidissima*), sea scallops (*Placopecten magellanicus*), and bay scallops (*Aequipecten irradians*). New Jersey is considered as one of the US's major ports for commercial fishery landings. The five major fishing ports in New Jersey are Belford, Point Pleasant, Barnegat Light, Atlantic City, and Cape May. Four of these ports are ranked among the top 50 ports in the nation based on harvest value. According to the State of New Jersey 2014 Hazard Mitigation Plan, the New Jersey fishing industry contributes an estimated \$4.5 billion annually from commercial fisheries, aquaculture, and recreational fishing. Based on data from "New Jersey's Commercial Fishing Industry" collected by the Garden State Seafood Association in 2011, New Jersey's most valuable fisheries were dominated by shellfish including sea scallops (\$142 million), surf clams/ocean quahogs (\$19 million), squid (\$13 million), blue crabs (\$9 million), hard shell clams (\$6 million), oysters (\$3 million), and lobsters (\$3 million). According to NOAA National Marine Fisheries Service, in 2012, "Shellfish landings revenue was dominated by New Jersey (\$159 million), followed by Virginia (\$114 million), and Maryland (\$63 million)." There is no recent NJDEP Bureau of Shellfisheries survey of hard clams (*Mercenaria mercenaria*) stock assessment of the Manasquan River. Factors that contribute to having a viable resource include salinity, dissolved oxygen levels, bottom conditions, and predation. Historically, the Manasquan River has areas where there are only a few hard clams and other areas within the river where there is a high density of hard clams. There are soft-shelled clams and blue mussels that reside around the Point Pleasant Canal and Gull Island. The Manasquan River is also home to commercial clam boats which harvest shellfish from ocean waters.

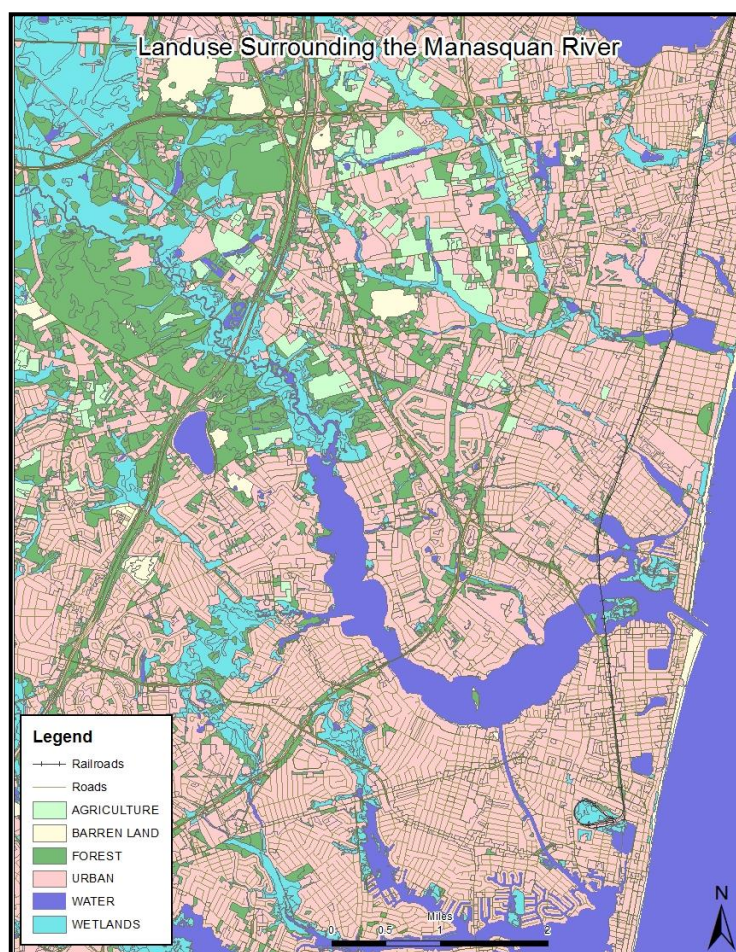
SHORELINE SURVEY: EVALUATION OF POTENTIAL POLLUTION SOURCES

Shoreline surveys or site-specific tours of areas nearby or abutting shellfish growing waters can provide insight as to the location and nature of land use, surface water discharges, marinas, unpermitted discharges, and stormwater inputs. The following sections detail information derived collectively from recent shoreline surveys.

New and reconstructed residential homes were observed on shoreline survey, in addition to repairs at marinas and new/repared sections of bulk heading. The upstream wetlands still support many crucial wildlife habitats. Numerous fishermen and waterfowl were observed during shoreline surveys.

Land Use

The Manasquan River is a popular recreational destination. Recreational use has substantially increased in the summer months due to a seasonal growth in population. Popular ocean bathing beaches are located both north and south of the Manasquan Inlet. The Manasquan Inlet provides direct access to the Atlantic Ocean, which attracts fishermen, both commercial and recreational. As a result, there are many marinas within the river. There are also many waterfront restaurants that provide boat access. Consequently, much of the river shoreline is bulkheaded.



There are wetlands and forested areas near the headwaters of the Manasquan River, but as the river runs southeast toward the ocean, the land use becomes mostly urban (see adjacent figure). Much of the Manasquan River coastline is developed residentially, with commercial sections near the inlet. Gull Island, in the eastern portion of the river, and the Manasquan River Wildlife Refuge are conservation areas.

Allaire State Park is located in the upper portion of this watershed. The Monmouth County Park System manages several parks in the Manasquan River watershed, including the Manasquan River Reservoir and the Manasquan River Greenway, upstream of the shellfish growing waters in Howell Township. There are some golf courses in the area; including Manasquan River Golf Club which borders the Manasquan River in Brielle Borough.

As the demand for more urban land has increased, more forest, wetland, and agriculture are being redeveloped to urban areas, putting stress on the surrounding ecosystem. The replacement of cropland, grassland, and forested areas with impervious surfaces and buildings greatly intensifies stormwater runoff, diminishes groundwater recharge, and promotes urban heat formation. These factors were identified by the United States Environmental Protection Agency (USEPA) as being the most significant threat to water resources. The toxic and pathogenic pollutants transported from impervious surfaces to watersheds in the form of non-point source pollution have been shown to substantially degrade streams, rivers, and lakes.

This area was heavily influenced by Superstorm Sandy in October of 2012. Since Superstorm Sandy there has been a lot of construction on condominiums and residential homes and rebuilding of docks, bulkheads and other structures at residential homes and commercial marinas; some areas are still undergoing repairs or have not been repaired.

Vegetation is an essential part of the marine ecosystem, offering habitat and nursery grounds for numerous species. In the Navesink River, submerged aquatic vegetation (SAV) is prevalent in shallow areas. Some of the most common species of SAV include widgeon grass (*Ruppia maritima*), sago pondweed (*Potamogeton pectinatus*), horned pondweed (*Zannichellia palustris*) and eelgrass (*Zostera marina*).

Waterfowl are known to inhabit this area, especially during winter months. Herons, ducks, geese, and egrets are frequently documented. The area is a well-known tourist destination on the New Jersey shore and experiences an influx of population in the summer months.

Surface and Ground Water Discharges

A surface water discharge involves the release of treated effluent from various municipal and industrial facilities directly into a river, stream, or the ocean. The discharge of pollutants from a point source is authorized under New Jersey Pollutant Elimination System (NJPDES), and the regulations are found at N.J.A.C. 7:14A. The main purpose of the NJPDES program is to ensure proper treatment and discharges of wastewater. By doing so, the permits limit the amount or concentration of pollutants that can be discharged into ground water, streams, rivers, and the ocean.

The Manasquan River Reservoir is managed by New Jersey Water Supply Authority and provides drinking water for residents of Monmouth County; the reservoir has over a 4 billion gallon capacity (NJWSA, 2016). Brick Township Reservoir is a 90-acre reservoir located in Brick Township that serves Northern Ocean County; waters from the Metedeconk River are pumped up to the reservoir.

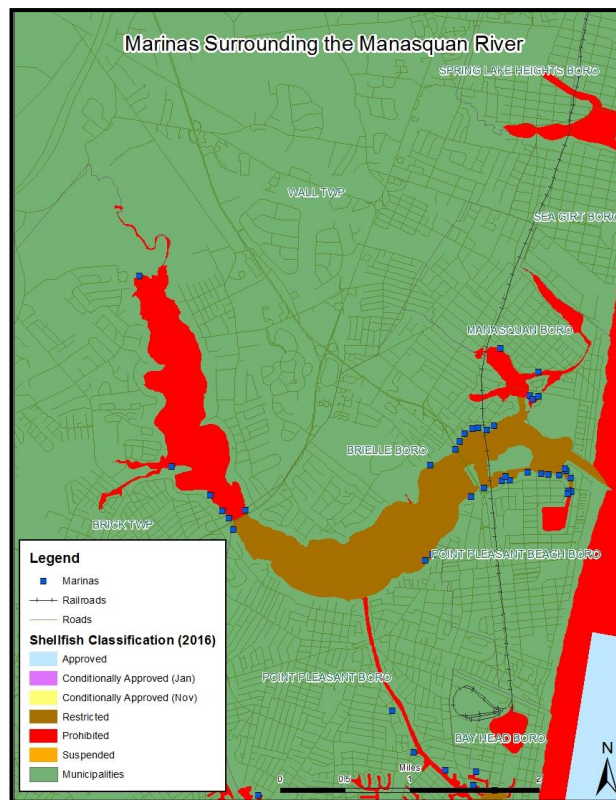
There are no direct discharges into the waters of the Manasquan River. The Northern Water Pollution Control Facility in Brick Township (below the Metedeconk River) treats the waste material of Bay Head, Brick Township, Mantoloking, Point Pleasant Beach, Point Pleasant Borough, Lakewood Township, and Jackson Township. This facility was built in 1976 and the maximum flow from the facility is 32 million gallons per day (OCUA, 2016). Once treated, the effluent is ‘disinfected and discharged’ one mile into the Atlantic Ocean via an outfall pipe. The South Monmouth Regional Sewerage Authority (SMRSA) provides secondary treatment to Belmar, Lake Como, Brielle, Manasquan, Sea Girt, Spring Lake, Spring Lake Heights, and Wall Township. The SMRSA was founded in May of 1970 and the maximum flow from the facility is 9.1 million gallons per day. The treated effluent is discharged via an outfall sewer extending from the plant to the ocean-front through a diffuser system extending 4700 feet offshore. (SMRSA, 2016).

Marinas

Marina facilities have the potential to affect the suitability of shellfish growing areas for the harvest of shellfish. The biological and chemical contamination associated with marina facilities may be of public health significance. The discharge of sewage from vessels into the waterways can contribute to the degradation of the marine environment by introducing disease-causing microorganisms (pathogens), such as bacteria, and viruses, into the marine environment. Chemical compounds, such as oil and gasoline resulting from spills, leaks, and pressure washing from vessels can poison fish and other marine organisms. Research has shown that by-products from the biological breakdown of petroleum products can harm fish and wildlife, and pose threats to human health if ingested. For this reason, waters within the marina basin are restricted to shellfish harvesting.

Boating is a popular summertime activity on the Manasquan River. In this growing area there are a total of 38 marinas (see adjacent figure). Most of these marinas are located near the inlet. Some of the marinas in this area run charter and party boat trips, although there are also many private boats utilizing the marinas. All marinas, anchorages, or other places where docking or mooring facilities are provided for boats are classified as *Prohibited*. Depending on the size of the marina and the water quality, water immediately adjacent to each marina may be classified as *Prohibited*, *Restricted*, or *Conditionally Approved* (no harvest during summer months when the marina is active).

Marina buffer zones were calculated using the Virginia Model or the marina buffer equation, depending on the location. Additional information on the marina equations used for buffer generation can be found in the NJDEP *Shellfish Growing Area Report Guidance Document* (2012).



The Manasquan River was made a “No Discharge Zone” in 1998 (USEPA, 1998). Some marinas on the Manasquan River have pledged to pursue NJDEP certification as a New Jersey Clean Marina; for more information on participating marinas, please visit <http://www.nj.gov/dep/njcleanmarina/>.

Spills, Unpermitted Discharges, and Closures

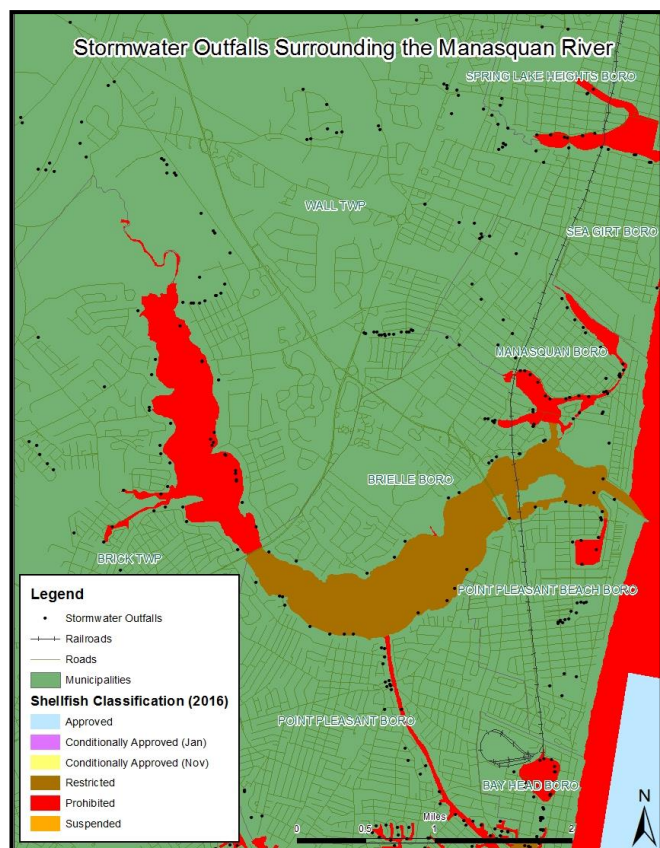
Spills reported to the DEP hotline (1-877-WARN-DEP) are passed on to the BMWB when shellfish waters are involved. Since there is a direct relationship between the pollution of shellfish growing areas and the transmission of diseases to humans, BMWB must carefully assess each spill occurrence. If the spill is determined to be detrimental to the shellfish beds, then a closure is made in the impacted area to protect public health. The closure is not lifted until the source of the problem is fixed/eliminated and all sample results in the closed area meet their existing classification.

There were no significant spills or unpermitted discharges requiring closures in the Manasquan River since the last reappraisal report on the area. However, there was a suspension of harvest in the Lake Louise and the Glimmer Glass region of this growing area prior to the promulgation of the downgrade into regulation. Closures prior to 2013 are discussed in the prior reports on this area, see www.nj.us.gov/dep/bmw for more information.

The process of dredging can impair water quality and contaminate shellfish beds that are near dredging and disposal sites. BMW is given the opportunity to review such projects through CAFRA application submissions and will request denial or modification of a project if the proposed dredging or disposal site can potentially contaminate shellfish beds or impair water quality. BMW's comments are taken into consideration by the NJDEP, Division of Land Use Regulations (DLUR) when approving or denying a permit.

Stormwater Discharges

Environmental pressures on shellfish beds in New Jersey can originate from materials that enter growing waters via stormwater discharges. Runoff is a term for the surface water that moves from land to the ocean. During this process the water picks up both nutrients (helpful and harmful) and pollutants. While some of this runoff provides nutrients for plants and animals, it also carries pollutants that can potentially contaminate the waters. Some pollutants include bird waste, agricultural pesticides, animal waste, and bacteria from faulty septic systems and failing municipal infrastructure. Storm drains along roads collect the runoff and transmit it to stormwater outfalls. The outfalls discharge the runoff into streams, bays, oceans, and other bodies of water. Stormwater outfalls are often found in urban areas and are especially common within lagoon communities. The first flush after a rain event often carries the most pollutants.



BMW conducts stormwater studies to determine the effect of stormwater runoff. Water samples are taken during a storm event and the preceding days in order to determine the effect of runoff. Once a possible source of the problem is identified, the appropriate people (usually the municipality/county) are notified to remedy the situation.

There are numerous stormwater inputs into the Manasquan River and its tributaries (see adjacent figure). These numerous stormwater inputs have the potential to negatively impact the water quality within this growing area. Stormwater outfalls are one of the most significant non-point sources of pollution in this shellfish growing area. Considering the substantial number of outfalls in this area, it is crucial to understand the importance of their location and connections, in order to prevent pollution. This report recommends performing targeted sampling during storm events in the Manasquan River to identify potential sources of pollution, as well as

working with the local municipalities to address areas identified during targeted sampling and to take actions or corrective measures to improve the bacterial water quality.

WATER QUALITY STUDIES

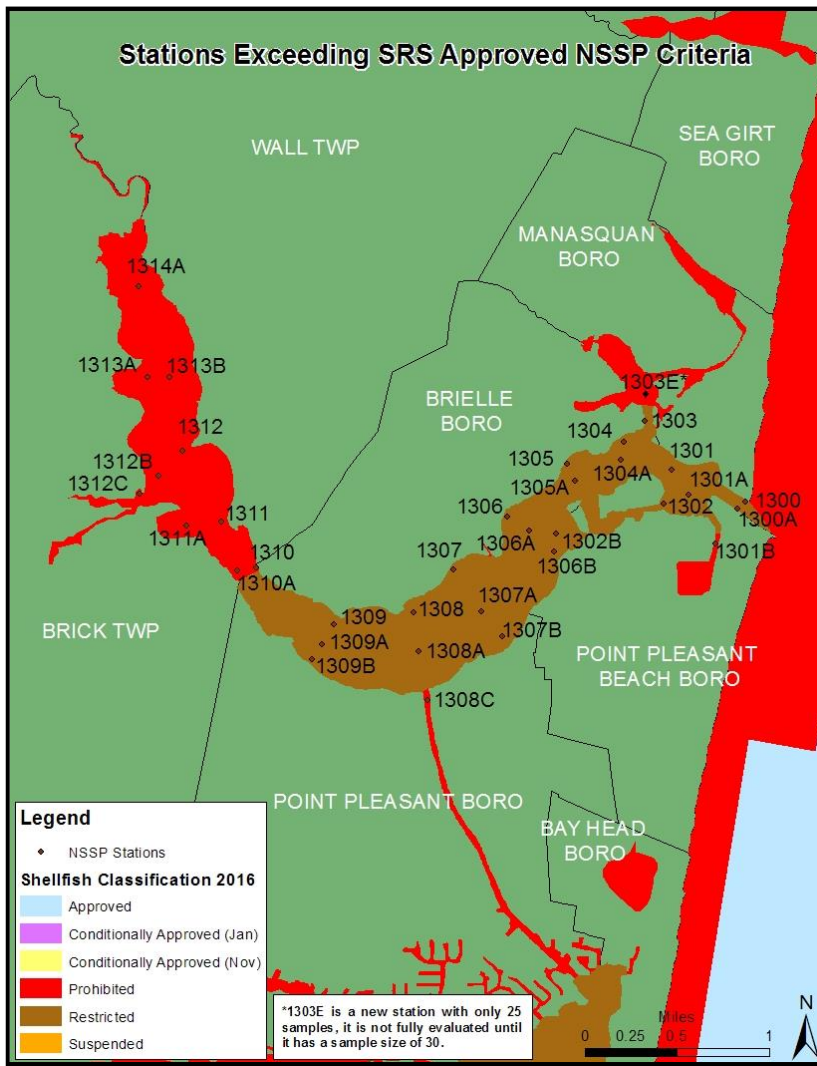
Sampling Strategy

The National Shellfish Sanitation Programs' Guide for the Control of Molluscan Shellfish (NSSP Guide, 2015) gives the State Shellfish Control Authority the option of choosing one of two water monitoring sampling strategies for each growing area, Adverse Pollution Condition Monitoring or Systematic Random Sample Monitoring. For additional information on the types of sampling strategies see the NJDEP Shellfish Growing Area Report Guidance Document (2012). This shellfish growing area is not impacted by discharges from sewage treatment facilities or combined sewer overflows; therefore, it is sampled under the Systematic Random Sampling Monitoring strategy (SRS).

New Jersey bases its growing water classifications on the fecal coliform criterion. The classification criterion is composed of a measure of the statistical 'central tendency' (geometric mean) and the relative variability of the data set. The criteria were developed by the NSSP to ensure that shellfish harvested from designated waters would be safe for human consumption (NSSP, 2015). For the Systematic Random Sampling Strategy, variability is expressed as the Estimated 90th percentile.

Water sampling in the Manasquan River was performed in accordance with the Field Procedures Manual (NJDEP, 2005). Water quality sampling, shoreline, and watershed surveys were conducted in accordance

with the NSSP *Guide for the Control of Molluscan Shellfish*, 2015 Revision. Data management and analysis were accomplished using database applications developed for the Bureau of Marine Water Monitoring. Mapping of data was performed with Geographic Information System software (GIS: ArcMap).



Bacteriological Quality

Approximately 1000 water samples were collected from this shellfish growing area for fecal coliform testing from August 1, 2013 through August 31, 2016. Nearly 1,600 stations are monitored each year for coliform levels throughout the state; 34 stations are located in Manasquan River (see adjacent figure).

Compliance with NSSP Criteria

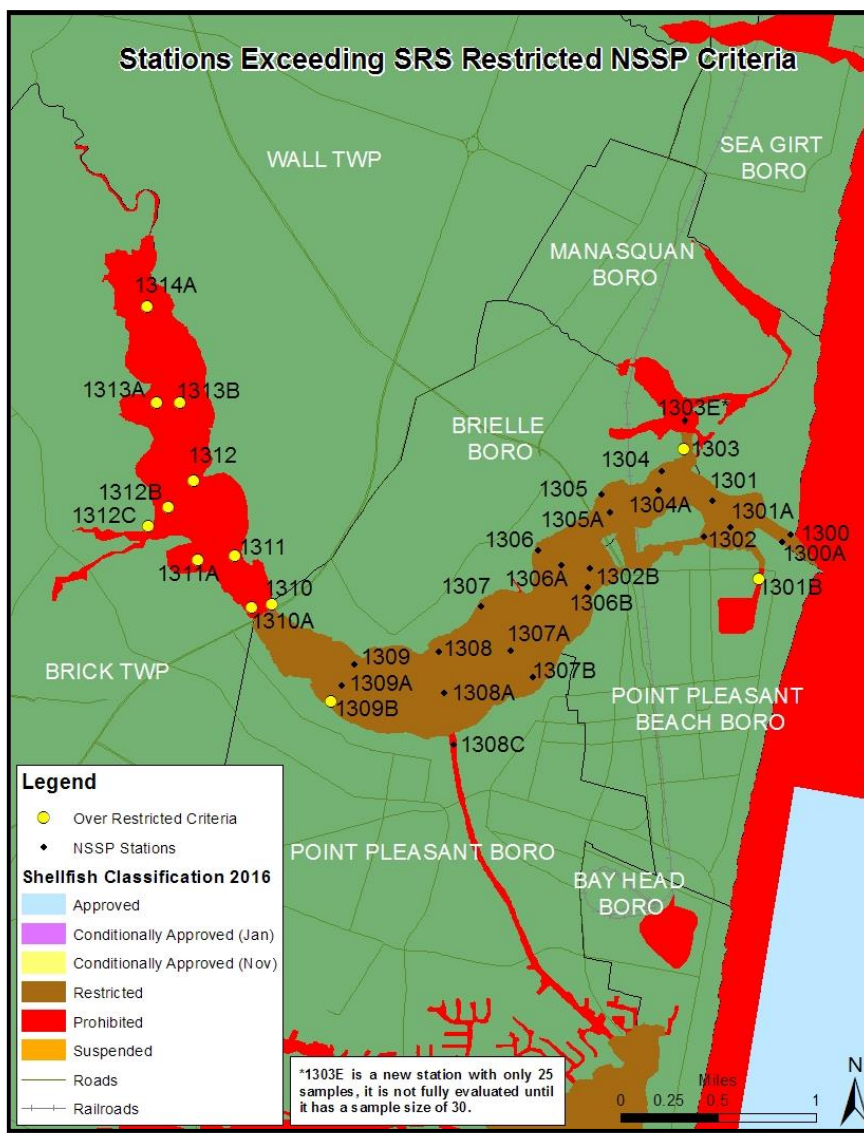
According to the NSSP Guide, the water quality of each growing area must be evaluated before an area can be classified as *Approved*, *Conditionally Approved* (November - April or January - April), *Restricted*, or *Prohibited*. A *Conditionally Approved* area must be sampled and meet the *Approved* criterion during the time of the year that it is open for harvest. The summer season runs from May through October, and the winter season runs from November through April.

There is one assignment run for the Manasquan River. This report examined the data from the assignment runs conducted from August 1, 2013 to August 31, 2016. The assignment runs during this timeframe provided sufficient samples for evaluation, bearing in mind the sample size must be at least 30 for each station according to the Systematic Random Sampling (SRS) strategy. Station 1303E is a newer station and does not yet have the 30+ samples to evaluate; however preliminary data shows that this station is appropriately classified.

The NSSP Guide establishes the guidelines for classification. In order for waters to be classified as *Approved* the Geometric Mean must be below 14 CFUs/100mL and the Estimated 90th percentile must be below 31 CFUs/100mL. For waters to be classified as *Restricted* the Geometric Mean must be below 88 CFUs/100mL and the Estimated 90th percentile must be below 163 CFUs/100mL.

Twenty-eight (28) stations within the Manasquan River did not meet the year-round SRS *Approved* criteria. There are no *Approved* waters within this shellfish growing area. All 28 stations are located in *Restricted* or *Prohibited* waters.

Thirteen stations sampled exceeded the SRS year-round criteria for *Restricted* waters; ten of these stations are located in the upper *Prohibited* portion of the river, two stations are in *Restricted* water. Station 1309B is located in *Restricted* waters just east of the Route 70 bridge and station 1303 is located in *Restricted* waters just outside of the *Prohibited* Glimmer Glass region. Stations 1309B and 1303 exceed the Estimated 90th Percentile *Restricted* criteria of 163 CFUs/100mL (see adjacent figure); the geometric means are well within the NSSP guide criteria of 88 CFUs/100mL. The Estimated 90th Percentile facilitates the use of a systematic random sampling strategy, while protecting against the potential public health problems that may result when shellfish are consumed from growing waters that

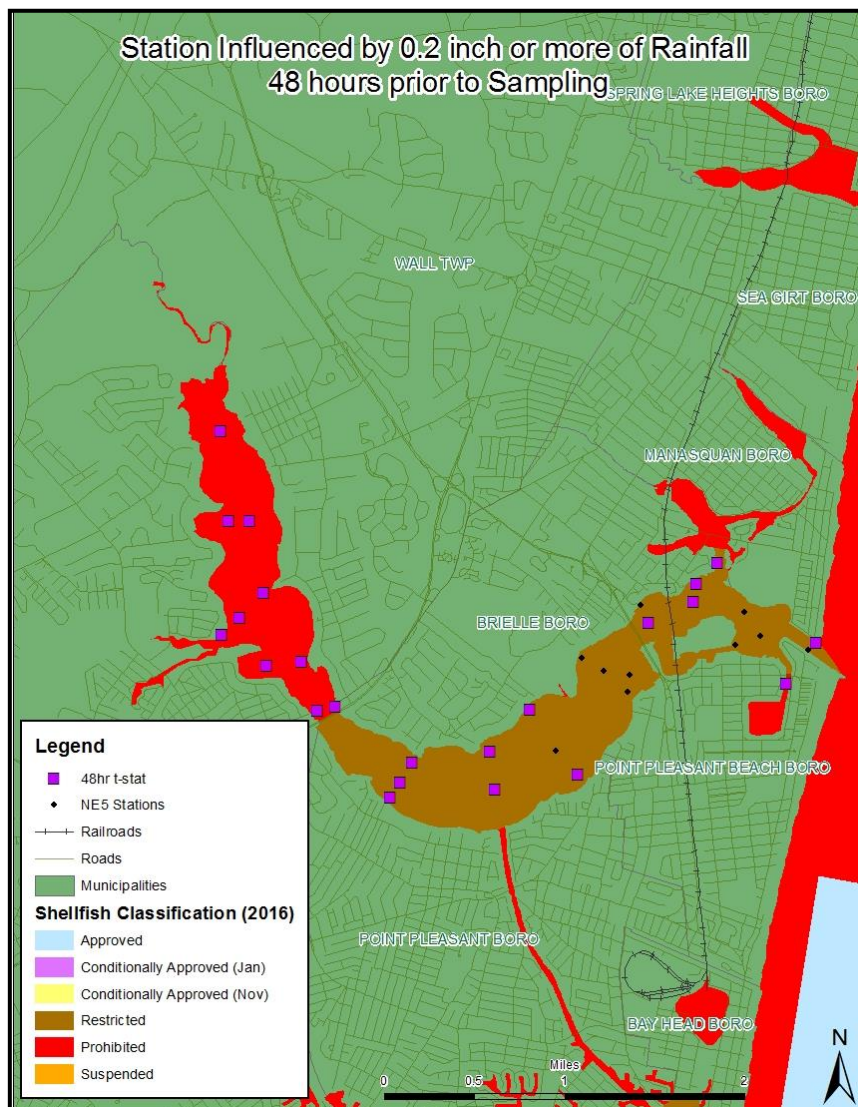


are adversely affected by intermittent pollution events. These two stations saw a spike in fecal coliform levels on June 29, 2015 when it rained over 2 inches within 48 hours of sampling; rainfall over 2 inches is uncommon. The *Restricted* waters of the Manasquan River are not currently used for depuration or relay; there is no commercial or recreational harvest permitted. The recommendation is to continue to monitor the data for these two stations, see Recommendations below for more information.

Rainfall Effects

Precipitation patterns in the coastal areas of New Jersey are typical of the Mid-Atlantic coastal region. Summer storms are localized and often associated with thunder and lightning activity. Winter storms are frequently associated with northeasters. Hurricanes can occur during the summer and early fall.

The National Weather Service (NWS) provides 24 hour estimated precipitation based on Multi-Sensor Precipitation Estimation (MPE) calculations using data collected from NWS' NEXRAD radar, together with rain gage observations and recordings. Rainfall amounts are based on the closest established NWS station; each assignment run is assigned to a weather station to accurately reflect the rainfall at the sampling stations; this shellfish growing area uses rainfall station RA007. The Manasquan River has a semi-diurnal tidal exchange with the Atlantic Ocean via the inlet. The tidal range of the ocean waters near the Manasquan Inlet is four feet; this tidal range gradually decreases as you move westward towards the head waters of the river.



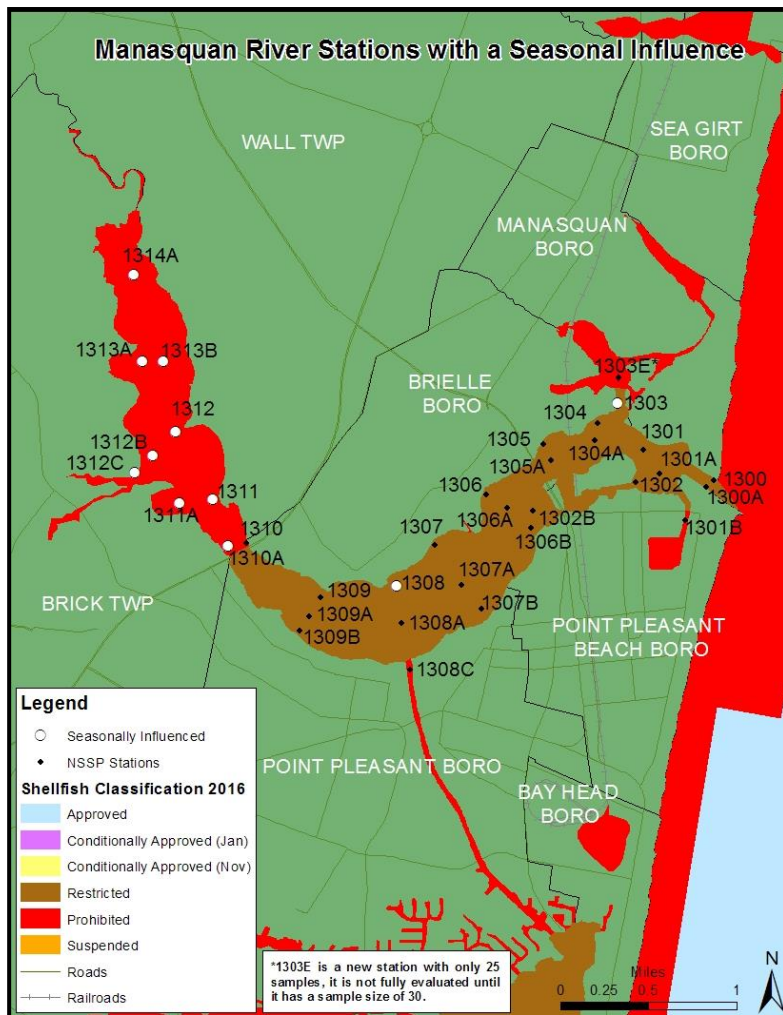
To determine whether rain can influence water quality, WM&S/BMWM uses the t-test method to assess rainfall effects. This method compares the fecal coliform MPN values from samples collected during dry weather to samples collected during wet weather and identifies areas where runoffs can potentially affect water quality. The *t*-statistical probability must be less than or equal to 0.05 for a station to be rainfall impacted. There is also a wet/dry cutoff for each growing area that dictates what data is considered 'wet' and what data is considered 'dry'. The scenario used for this growing area was based on a wet/dry cutoff of 0.2 inch.

The effects of the 'first flush' should be captured by the '24 hours prior to sampling' *t*-statistical probability. Results are also determined for the

‘cumulative 48 hours prior to sampling’ and the ‘cumulative 72 hours prior to sampling’. These t -statistical probabilities help to determine if there is a delayed impact on the waterbody.

The Manasquan River experiences higher coliform levels during wet conditions. The immediate impact after 0.2 inch of rainfall is observed in the western, (*Prohibited*) portion of the river and the Glimmer Glass region. The effect of rainfall is seen throughout the river within 48-72 hours of a rain event (see adjacent figure). The landuse surrounding the river is almost entirely urban and the river itself is very shallow, which limits the dilution of the potentially polluted runoff from rainfall.

Seasonal Effects



Seasonal variations in temperature, precipitation, wind, and circulation of the atmosphere affect marine environments. Seasonal variation may also be the result of a variety of conditions, including specific agricultural land-use practices, biological activity and/or stream flow. BMW uses a t -test method to determine which areas may be influenced by seasonal variation by comparing the summer and winter total coliform values. The t -statistical probability must be less than 0.05 for a seasonal difference at that station to be considered significant. Statistically significant seasonal impacts were observed at eleven of the stations in the Manasquan River, nine of these stations are in the western, (*Prohibited*) portion of the river. Stations near the inlet show little seasonal variation; a seasonal variation (with higher summer values) is observed in the western, (*Prohibited*) portion of the river. Summer includes the months of May through October and winter includes November through April. Summertime pressures are usually more likely to impact these waters because of heavy boat travel and higher summer

temperatures. The water quality also has the potential to be affected by other non-point sources from increased summer population and/or increased use of recreational water activities.

RELATED STUDIES

Water Monitoring and Standard's (WM&S) Bureau of Marine Water Monitoring (BMWM) also monitors New Jersey waters for levels of nutrients (estuarine monitoring), phytoplankton, and enterococcus levels to ensure adherence with bathing beach standards.

Nutrients

Nutrient stations are sampled monthly on a biennial basis. A total of 82 nutrient stations are spread throughout the State's back-bay waters and tidally impacted rivers. At these nutrient monitoring sites, various parameters are measured including water temperature, biogenic silica, chlorophyll a, pH, salinity, secchi depth, total suspended solids, dissolved oxygen, ammonia, nitrate and nitrite, orthophosphate, total nitrogen and total phosphorus. BMWM compiles the results of nutrient levels and then prepares a separate report. For a full nutrient assessment, see www.nj.gov/dep/bmw.

Phytoplankton

Phytoplankton are photosynthetic algae that play a critical role at the base of aquatic food webs. The BMWM conducts routine sampling year-round at 45 static stations (up to 10 times a year) throughout New Jersey marine waters to detect the occurrence of species of marine phytoplankton that can produce biotoxins. BMWM, in accordance with the NSSP requirements, also analyzes the data and annually updates its Marine Biotoxin Contingency Plan. For more information on the BMWM phytoplankton program visit the BMWM website, www.nj.gov/dep/bmw.

Cooperative Coastal Monitoring Program (Bathing Beaches)

The WM&S group cooperatively works with the New Jersey Department of Health and local health agencies to monitor recreational bathing beaches in New Jersey. Together, these agencies implement the Cooperative Coastal Monitoring Program (CCMP). With this program, the coastal and estuarine waters that are open to the public for recreational bathing are surveyed and regularly monitored for concentration of bacteria.

Typically, bathing beach samples are taken once a week, usually on Monday, for the entire summer. These samples are tested for Enterococci as a fecal coliform indicator. Ocean and bay recreational beaches are subject to opening and closing procedures of the State Sanitary Code. Local health agencies and law enforcement issue an advisory and may close a bathing beach if the results exceed the State Sanitary Code of 104 Enterococci per 100mL. Stations must be re-sampled the following day when bacteria concentrations exceed the primary contact standard of 104 Enterococci per 100 mL of sample. Two consecutive samples that exceed the standard require the closing of the beach until a sample is obtained that is within the standard. Beaches can also be closed at any time if health or enforcement agencies believe it is in the interest of public health. BMWM utilizes these data as adjunct information; the closure of shellfish waters does not correspond with these results. Please see <http://www.njbeaches.org/> for further information.

The CCMP, in conjunction with US Army Corps of Engineers, also carries out the NY/NJ Harbor Estuary Program's Floatables Action Plan that utilizes aerial surveillance to detect floating solid waste and debris. Flights of the NJ coast are scheduled for six days a week, weather permitting, during the summer months.

Toxic Monitoring

Substances such as heavy metals, pesticides, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) are dangerous and can be found in the environment. These substances can be released into the environment by storm drains, runoff, sewage treatment facilities, and atmospheric deposition. Bottom dwelling organisms are most vulnerable to these chemicals and may pose a risk to human health if consumed.

USEPA National Coastal Condition Assessment Program (NCCA)

USEPA National Coastal Condition Assessment (NCCA) and its partners began sampling in the coastal and estuarine waters of the United States in 1990. Data collected includes water column parameters, sediment chemistry & toxicity, benthic communities, and tissue contaminants. NCCA data is used as an indication of areas that need to be investigated further concerning human and/or ecosystem health issues. Please see <http://www2.epa.gov/national-aquatic-resource-surveys/national-coastal-condition-assessment> for the 2010 report and the most recent data.

National Oceanic and Atmospheric Administration (NOAA) Mussel Watch

The National Oceanic and Atmospheric Administration (NOAA) Mussel Watch Program monitors the levels of toxins and metals in shellfish. The blue mussel, *Mytilus edulis*, occurs worldwide and effectively takes up toxins and metals from seawater and sediments. The toxins and metals then become concentrated in the mussel's living tissues. Assays from the living tissues of this shellfish can be made easily and cheaply. The Mussel Watch Program monitors metals such as mercury, lead, zinc, nickel, cadmium, copper, chromium, aluminum, silicon, manganese, iron, arsenic, selenium, tin, antimony, thallium, and silver. The program also monitors toxins such as the synthetic organic compounds that are widely used in pesticides, solvents, flame-retardants, and other products. There is no mussel watch station in the Manasquan River. Please see <http://coastalscience.noaa.gov/about/centers/ccma> for further information and the most recent data.

CONCLUSIONS

The appendix of this report lists the water quality data obtained from the sampling period of August 1, 2013 to August 31, 2016. Systematic Random Sampling strategy was used to collect the samples, laboratory tests were run for fecal coliform, and a thorough analysis of the data was assembled for this report. Analyses of the Manasquan River shellfish growing area samples indicate that all but 2 stations meet the standards of the NSSP Guide. The bacteriological data for stations 1303 and 1309B do not support the fecal coliform Estimated 90th percentile levels for *Restricted* criteria. The Geometric Means for stations 1303 and 1309B were within the *Restricted* fecal coliform criteria.

There were eleven stations with a seasonal component. Overall, summer geometric mean tends to be higher than winter geometric mean, which is likely due to summer related activities, marinas, and wildlife activities that occur more frequently during the summer season. It was found that almost the entire Manasquan River is impacted by rainfall accumulations above 0.2 inch, particularly 48-72 hours after a rain event.

RECOMMENDATIONS

There is no recommended upgrade or downgrade at this time. As mentioned in the Compliance with NSSP Criteria and Conclusion sections above, stations 1303 and 1309B exceed the Estimated 90th Percentile NSSP Guide criteria for fecal coliform. These stations, as well as many other stations, saw a spike in fecal coliform levels on June 29, 2015 when it rained over 2 inches within 48 hours of sampling. Rainfall events totaling over 2 inches of rain within 48 hours of sampling are very uncommon and although it does show an intermittent pollution event, these *Restricted* waters of the Manasquan River are not currently used for depuration or relay. Since there is no commercial or recreational harvest permitted there is a very low risk to public health. These stations did not exceed the Geometric Mean NSSP Guide criteria. Considering this information BMWB has decided to keep the Manasquan River as it is currently classified, but will monitor the river very closely, especially in the areas of station 1303 and station 1309B.

Since high levels of coliform are observed in the river after significant rainfall events, another recommendation is to perform targeted sampling during storm events in the Manasquan River to identify potential sources of pollution, work with the local municipalities to address areas identified during targeted sampling and take actions or corrective measures to improve the bacterial water quality.

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APPENDICES

- A. Statistical Summary
- B. Seasonal Evaluation
- C. Precipitation
 - Rainfall Amount
 - Wet/Dry Statistics
- D. Data Listing: August 1, 2013 to August 31, 2016